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# Developing a new apathy measurement scale: Dimensional Apathy Scale



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## ABSTRACT

Apathy is both a symptom and syndrome prevalent in neurodegenerative disease, including motor system disorders, that affects motivation to display goal directed functions. Levy and Dubois (2006) suggested three apathetic subtypes, Cognitive, Emotional-affective and Auto-activation, all with discrete neural correlates and functional impairments. The aim of this study was to create a new apathy measure; the Dimensional Apathy Scale (DAS), which assesses apathetic subtypes and is suitable for use in patient groups with motor dysfunction. 311 healthy participants (mean = 37.4, S.D. = 15.0) completed a 45-item questionnaire. Horn's parallel analysis of principal factors and Exploratory Factor Analysis resulted in 4 factors (Executive, Emotional, Cognitive Initiation and Behavioural Initiation) that account for 28.9% of the total variance. Twenty four items were subsequently extracted to form 3 subscales – Executive, Emotional and Behavioural/Cognitive Initiation. The subscale items show good internal consistency reliability. A weak to moderate relationship was found with depression using Becks Depression Inventory II. The DAS is a well-constructed method for assessing multidimensional apathy suitable for application to investigate this syndrome in different disease pathologies.

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## 1. Introduction

Apathy has been defined as reduced motivation towards goal directed behaviours (Marin, 1996). This can often be observed overtly as a loss of energy, interests and emotion (Marin, 1991). In a healthy population, apathy is a fluctuating state that is frequently experienced by many individuals. This is known as selective or relative apathy, where an individual is not interested or motivated towards particular activity (Marin, 1990). It is observable in normal populations (Brodaty et al., 2010). However, when this state reoccurs or becomes constant it may be indicative of underlying pathology impairing motivational functioning and is regarded as a prevalent symptom in neuropsychiatric and neurodegenerative populations (for review see Chase, 2011).

The concept of apathy is thought to be composed of several elements pertaining to emotion, cognition and behaviour (Marin, 1991), the evidence for which has been observed through a review of neurological findings (Levy and Dubois, 2006; Levy, 2012). Based on observations of patients with prefrontal cortex and basal

ganglia lesions Levy and Dubois (2006) proposed three underlying apathetic subtypes (see Table 1). While these three subtypes have overlapping similarities to Marin's proposed triadic Cognitive-behavioural-emotional structure, they differ in the Auto-activation subtype, which is defined by problems with initiation of behaviours and cognition.

In Cognitive apathy, or 'Cognitive inertia' (Levy and Dubois, 2006) the goal directed behaviour is reduced due to impaired Cognitive functions needed to implement planned actions. This is similar to dysfunction of executive processes, which are necessary to achieve goals, including planning, organisation and attention monitoring. These processes are strongly associated with dysfunction of the dorsolateral prefrontal cortex damage (Fuster, 1999; for review see Stuss (2011)).

Apathy and depression have overlapping symptomology (van Reekum et al., 2005) but an important distinction exists in that apathy relates to disorders of motivation where depression is an affective disorder (Marin et al., 1994; Levy et al., 1998). The Emotional-affective subtype of apathy can be distinguished from depression due to the presence of emotional neutrality, whereas depression results in either extreme sadness or, in the case of bipolar affective disorder, also happiness. It has been suggested that dysfunction of the orbito-medial prefrontal cortex was associated with this type of apathy (Levy and Dubois, 2006). The orbito-

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**Table 1**  
Apathy subtypes (adapted from Levy and Dubois (2006)).

Subtype	Description
Cognitive	The inability to manage goals and cognitively strategize with a negative impact on cognitive and action planning.
Emotional-affective	Diminished integration, processing and expression of emotional behaviours and cognition resulting in a continuous lack of extreme affect.
Auto-activation	Lessened initiation of thoughts or behaviours that are related to functionality (i.e. lack of motor responsiveness (akinesia) and lack of discourse (alogia, Habib, 2004)).

medial prefrontal cortex regions are connected to areas, which facilitate emotional processing of information pertaining to goal directed behaviour (Levy and Dubois, 2006). Damage to the orbito-medial prefrontal cortex is suggested to disrupt the flow of emotional processing which may result in reduced processing of emotional behaviour, context or outcome. Damage to such systems could disrupt the motivation for goal directed behaviour due to emotional desensitisation to both positive and negative stimuli. The emotional ambivalence may influence decision making due to lack of emotional context.

Finally, the Auto-activation apathetic deficit has been observed as early as 1981 by Laplane (in Habib, 2004) as “loss of psychic auto-activation” associated with the presence of structural neuroimaging abnormalities in of the globi palli and is most commonly characterised by decreased Cognitive and physical initiative activity. Specifically, lesions to the medial prefrontal cortex and basal ganglia have been found to manifest as Auto-activation deficits akin to apathy (Levy and Dubois, 2006). Levy and Czernecki (2007) suggested that lesions in the basal ganglia were associated with reduced goal directed behaviour due to disconnection with the frontal lobes.

The concept of apathy as multidimensional has gained widespread recognition (Marin et al., 1991; Cummings et al., 1994; Robert et al., 2002; Sockeel et al., 2006; Starkstein and Leentjens, 2008). Furthermore diagnostic criteria for apathy in Alzheimer's disease and other neuropsychiatric disorders have been proposed, based on a consensus of an international task force of experts in neuropsychiatric symptoms in neurodegenerative disease (Robert et al., 2009). The criteria have been sub-divided into three symptom-domains representing behavioural apathy, Cognitive apathy and emotional apathy concordant with Marin's original subclassification and highlighting the need for multidimensional assessment.

However, despite this view, there is a lack of objective tools to evaluate the different subtypes (Levy, 2012) and apathy is most typically assessed as a singular concept (for review see Clarke et al. (2011)), examples of which include Marin's Apathy Evaluation Scale (Marin et al., 1991), Neuropsychiatric Inventory apathy subscale (Cummings et al., 1994), the Frontal Systems Behavioural Scale – apathy subscale (Grace and Malloy, 2001) and scales assessing negative symptoms (Andreasen, 1982; Kay et al., 1989). In patients with schizophrenia, research using the Scale for Assessment of Negative Symptoms has shown a substructural structure to negative symptoms (Blanchard and Cohen 2006). This has prompted the development of novel and more comprehensive assessment methods for negative symptoms in schizophrenia, examples being the Brief Negative Symptoms Scale (Kirkpatrick et al., 2011) and the Clinical Assessment Interview for Negative Symptoms (Kring et al., 2013). These new methods have resulted in a new 2 dimensional substructures of negative symptoms composed of Apathy-Avolition and Diminished Expression. The former is defined by blunted affect and alogia whereas the Diminished Expression subtype is associated with anhedonia, asociality and avolition (Foussias and Remington, 2010). However, these profile subgroups are fairly new concepts and the scales detecting them have only recently been used in research practice.

The only established apathy measures that recognised the presence of an apathetic substructure through its assessment method are the Lille Apathy Rating Scale (Sockeel et al., 2006) and Apathy Inventory (Robert et al., 2002). The latter includes only one item per dimension and so does not provide a comprehensive assessment, while validation of the Lille Apathy Rating Scale in Parkinson's Disease patients, revealed a four factor structure; intellectual curiosity, self-awareness, emotion and action initiation (Sockeel et al., 2006) which did not map onto the established triadic structure – of Cognitive, emotional and behavioural classifications. Further use of the Lille Apathy Rating Scale subsequently focused on the total summative score of apathy despite evidence of multiple dimensions. Furthermore, the limited utility of some measurements in the comprehensive assessment of apathy is further confounded in patients with physical disability. Apathy is a common symptom in neurodegenerative disease in which motor system dysfunction is a typical feature for example amyotrophic lateral sclerosis (Girardi et al., 2011; Woolley et al., 2011) and Parkinson's disease (Pedersen et al., 2009). However, questionnaires typically include statements that rely on performing physical activity and apathy measurement may be falsely inflated as a consequence (Goldstein and Abrahams, 2013).

The aim of this research was to develop a new method of assessing apathy, the Dimensional Apathy Scale (DAS), a multi-dimensional approach based on Levy and Dubois' (2006) apathetic subtypes. Furthermore, in order to accommodate for the assessment of apathy in patients with motor dysfunction the scale was designed to minimise exaggeration of symptom due to physical disability.

Specifically, published scales were initially reviewed to identify questions, which would yield a triadic structured questionnaire according to Levy and Dubois' (2006) apathetic subtypes and produce DAS. Firstly, the psychometric properties of this 45-item scale were initially investigated and a 24-item scale developed. Secondly, the relationship between performance on the new scale and standardized measure of depression was explored.

## 2. Method

### 2.1. Participants

A total of 311 participants (217 females and 94 males) were recruited from the University of Edinburgh Departmental volunteer panel, the University of Hull and other volunteer groups. The majority of participants came from the University of Edinburgh Departmental volunteer panel. Participants were only asked to take part if they were healthy and the volunteer panel database was pre-screened to exclude participants with medical conditions. Table 2 shows the breakdown of sample

**Table 2**  
Sample characteristics.

Questionnaire type	N	Mean age (S.D.)	Min age	Max age	Mean YOE (S.D.)
Online	266	37.7 (14.7)	20	67	17.3 (3.0)
Paper and pencil	50	35.6 (16.5)	18	70	16.8 (2.7)
Total	311	37.4 (15.0)	18	70	17.2 (3.0)

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